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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/498,303	02/04/2000	Yong-Pil Han	MIT7941	8629

7590

10/07/2002

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EXAMINER

DANG, THI D

ART UNIT

PAPER NUMBER

1763

DATE MAILED: 10/07/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/498,303

Applicant(s)

HAN ET AL.

Examiner

Thi Dang

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 15 July 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 12-21 is/are allowed.
- 6) ☒ Claim(s) 1-11 and 22-24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

***Claim Rejections - 35 USC § 103***

1. Claims 1-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Tanaka* et al (5,288,333).

*Tanaka* discloses a wafer cleaning method in which a mixture of HF and H<sub>2</sub>O vapors is applied to the surface of a semiconductor device at a temperature above its dew point (cols. 11-12). The pressure and temperature conditions are controlled during cleaning to prevent aerosol formation, thus, allowing uniform etching. It is obvious that no more than a sub-monolayer of etch reactants is formed on the semiconductor device in *Tanaka*'s method because *Tanaka*'s method involves etching with HF and H<sub>2</sub>O vapors as in the case of applicants' method and the pressure and temperature are controlled so as to prevent aerosol formation. It is expected that any reaction products formed on the surface of the semiconductor device during *Tanaka*'s method would be vaporized. The claims broadly recite that the pressure and temperature conditions are controlled to produce a monolayer or sub-monolayer of etch reactants, but no specific pressure or temperature is stated. In addition, the term "submonolayer" is broad in its scope, and thus, does not further limit the claims in the way that would define the claimed method over that of *Tanaka*. As broadly claimed, applicants' method does not define over that of *Tanaka*.

2. Claims 7-11 and 22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Rose* et al.

*Rose* discloses a method for removing an oxide layer from a semiconductor device in which the oxide layer is exposed to an aerosol of frozen particles and a mixture of HF and water vapor (col. 5, lines 1-24). It is obvious that no more than a sub-monolayer of etch reactants is

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formed on the semiconductor device in *Rose's* method because *Rose's* method involves exposing the oxide layer to frozen particles and etching with HF and water vapors as in the case of applicants' method.

***Allowable Subject Matter***

3. Claims 12-21 are allowed.
4. The application having been allowed, formal drawings are required in response to this Office Action.

***Response to Arguments***

5. Applicant's arguments filed 7/15/02 with regard to the rejected claims have been fully considered but they are not persuasive.

Applicant's arguments concerning claims 1-6 do not commensurate with these claims. The term "no more than a sub-monolayer" has not been defined in the claims. The broadest interpretation of it is "less than a monolayer." According to applicant's own specification (page 5), the term "sub-monolayer" refers to "no more than about 95% monolayer coverage." In Tanaka's method, the "cleaning vapor is prevented from liquefaction" (col. 16, lines 25-26). If there is no liquefaction at the substrate surface, then there is no monolayer of reaction products produced by the vapor. No monolayer is certainly less than a monolayer. First, it should be pointed out that claims 1-6 do not exclude the spinning of the wafer or the UV radiation/ozone treatment of Tanaka. Second, even if there were condensed water droplets formed on the wafer surface, these droplets would still meet the claimed limitation of "sub-monolayer" because less than the whole surface being treated was covered.

With regard to claims 7-11 and 22-24, again, applicant's arguments do not commensurate with these claims. The term "no more than a multilayer" in claims 7, 8, 22 means anything less than several layers, including a monolayer. As shown by Figs. 2-2C, the foreign material (10) and the reaction by-products (24) are being removed from the substrate surface with the aid of the aerosol particles (22). Thus, Rose's method does not form a multilayer of etch reactants and products. In addition, there is no indication that Rose's method forms more than a sub-monolayer. With the aid of the aerosol particles and UV radiation, it is obvious that substantially all of the reaction by-products are removed in Rose's method (i.e., less than a monolayer). Rose's method is carried out at a certain temperature and pressure. Therefore, the temperature and pressure must have been controlled during treatment. Applicant argues that Rose relies on the aerosol flow to dislodge and remove the residue as it is produced on the substrate surface. The claims, however, do not exclude such action. Claims 7, 8 and 22 require exposing the substrate to a stream of frozen particles as in Rose's method. The claims do not define the claimed invention over the method of Rose, particularly when the claims do not specify any specific temperature and pressure.

### ***Conclusion***

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

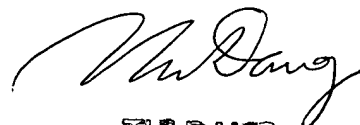
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will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thi Dang whose telephone number is (703) 308-1973. The examiner can normally be reached on Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (703) 308-1633. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

  
**THI DANG**  
**PRIMARY EXAMINER**  
**GROUP 1700**